

ACD 4000-300/15

The ACD 4000 is a fully digital servo amplifier designed for long life in extended temperature environments for applications such as RADAR, Power Generation, and other remote applications without environmental controls. The amplifier can control up to a 4000 Watt (5HP) BLDC servo motor in torque or velocity loop mode and can be digitally configured for a wide range of motors.

The amplifier is mounted on a rigid aluminum base plate and may be enclosed by an optional metal cover. In addition to providing the mechanical stability of the package, the base plate provides significant thermal mass, benefiting high crest factor applications, as well as a low thermal interface impedance for conduction of the average power dissipation of the amplifier. It is intended that the base plate will be mounted on a surface that removes heat such that the base plate temperature does not exceed 60° C, although temperatures up to 80° C are allowed with current derating.

To protect the amplifier and the motor, two different algorithms are used to track the thermal impact of the output current. The amplifier is protected using an advanced, real-time adaptive thermal model developed to limit extreme thermal cycling of the power devices as well as control their maximum junction temperature. At the same time, the amplifier protects the motor from thermal degradation by using a user programmable time constant and limit threshold applied to an independently maintained RMS current value. Short circuit and instantaneous over-current conditions are detected through multiple means, providing the redundancy necessary to achieve high system reliability. A tri-state (Red/Yellow/Green) LED provides a visual indication of the status of the amplifier.

Features & Benefits

- **High Temperature Operation** – Base plate operating range of -40 to 80°C
- **Advanced Commutation** –Space Vector Commutation for better bus voltage utilization for improved torque/speed curves compared with standard sinusoidal or trapezoidal commutation
- **Sensorless Control** – Option to eliminate the Resolver and Resolver cable without sacrificing the advantages of the advanced commutation
- **Flux Vector Current Control** – Provides improved current utilization
- **Digital Tuning** – Optimizes performance, enables cloning, eliminates pot drift, and can reduce inventory
- **“Get Me Home” Over-Temperature Mode** – provides warning and linear reduction of current limit to allow continued operation at a reduced capacity for a controlled shutdown
- **Extensive Fault Protection** – designed to protect the components, the amplifier, and the motor
- **Electrical Isolation** – Eliminates need for external isolation circuits
- **Diagnostics and Health Monitoring** – includes the simplicity of status LED's and the detailed data from serial port reports
- **Customization** – PCI can modify the drive to make it compatible with an OEM's tool



Precision Power and Performance

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ACD 4000-300/15 Specifications				
Parameter	Units	Min	Typical	Max
User Inputs				
Analog Command, differential input	volts		±10	±12
Analog Command, common mode input	volts		0	± 5
Analog Command, input impedance	kΩ		10	
Disable (sink current to common)	mA			4
User Outputs (Open collector)				
Vceo	volts			30
Isink	mA			20
Vce,sat@Isink	volt			0.4
Resolver Feedback				
Resolver Excitation Amplitude	Vp-p	3.2	3.6	4.0
Resolver Excitation Frequency	kHz		10	
Resolver Resolution (programmable)	bit	10		16
SIN/COS Input amplitude	V p-p	2.3	3.1	4.0
Control Loop				
Scaling (Adjustable with SCL command)	Amps RMS / Volt	0.0707		2.2
Linearity	%		3	
Dynamic Range	dB		60	
Bandwidth (typical, motor dependant)	Hz		4,000	
Current Loop Update Period	μS		25	
Load Inductance	μH	300		5000
Motor Speed (application dependent)	RPM	0		50,000
Power Stage				
PWM Frequency	kHz		20	
Nominal Bus Voltage Range (MIL-STD-704E compliant)	Volts DC	130	300	400
Maximum Output Current (5 sec)	Amps, RMS		22	
Continuous Output Current @ 60°C	Amps, RMS		15	
RMS Output Current, Derating above 60°C	Amps/10°C		2	
Standby Power requirements (nominal)	Watts		20	
Power Dissipation (8 Amp, RMS)	Watts		120	
Power Dissipation (15 Amp,RMS)	Watts		300	
Environmental				
Operating Temperature Range	°C		-40 to 80	
Storage Temperature Range	°C		-40 to 105	
Humidity (non-condensing)	%		95	
Barometric pressure	kPa	69.3		106.7
Vibration (20 Hz to 2kHz)	GRMS		3	
MTBF (Airborne Cargo, 50% duty cycle)	Hrs		100,000	
Mechanical Specifications				
Weight	Lbs		5.125	
Length	inches		10	
Width	inches		6.25	
Height	inches		3.125	



Power End



Signal End

Connector Name	Connector Type	Location	Comment
J1	DE 9-P	Signal end	Resolver interface / motor thermostat
J2	DB 25-P	Signal end	User I/O
J3	DE 9-S	Signal end	Simulated Quadrature Encoder outputs
P1	3 pin male terminal strip (Phoenix PC5/-3-G-7.62)	Power end	DC power in
P2	4 pin female terminal strip (Phoenix IPC5/-4-G-7.62)	Power end	Motor Power Out